Department of Energy
Washington, DC 20585

JUL 2 2 2008

Mr. Keith Takata
Division Director for the Superfund Division of Region IX
Environmental Protection Agency
75 Hawthorne Street
San Francisco CA 94105

RE: Request for the Department of Energy (DOE) cost estimates and work plans for radiological characterization study at Santa Susana Field Laboratory Area IV

Dear Mr. Takata:

The Environmental Protection Agency (EPA) requested that DOE share with EPA the work plans and cost estimates for the Gamma Walkover Survey and Radiological Background Study developed for DOE by its contractor CDM in conjunction with finalization of the Interagency Agreement (IAG) required by Pub.L. No. 110-161, between EPA and DOE. The work plans and cost estimates EPA requested are attached as well as two maps showing the density of the radiological and chemical sampling under consideration by DOE and CDM.

It is important to understand that these work plans and cost estimates are not final documents. They were prepared by CDM at the request of DOE in order to further develop recommendations made by CDM to DOE in the Draft Data Gap Analysis. The gap analysis is part of the process for the Environmental Impact Study DOE is preparing pursuant to the May 2007 Order from Judge Samuel Conti. These work plans and cost estimates were in the preliminary review stage and had not undergone a validation phase. The work on these plans was suspended because, at this time, DOE and EPA have agreed to have EPA perform this work. The enclosed work plans do not address the details of the additional soil sampling needs because CDM planned to develop that work plan after the receipt, review and incorporation of all comments on the draft gap analysis, which are expected by the August 15 comment deadline. CDM also planned to conduct the Gamma Walkover Survey first, to best inform additional soil sampling and then develop the more comprehensive field sampling plan based on the comments on the gap and the results of the Gamma Walkover Survey.

We request that EPA recognize the limited purpose of the work plans and cost estimates especially since they are draft documents that had not been thoroughly reviewed, revised and finalized. To the extent they are useful to EPA within these constraints; DOE is pleased to make them available for EPA's use.

Sincerely,

Cynthia V. Anderson

Cynthia Anderson
Deputy Chief Operations Officer for
Environmental Management

Enclosures:

Gamma Walkover Survey preliminary work plan
Background Radiological Study preliminary cost estimate
Gamma Walkover Survey preliminary cost estimate
Radiological proposed sampling density map
Chemical proposed sampling density map

The text and tables on the following pages provides the Basis of Estimate (BOE) for a soil radionuclide background study needed to support the risk assessments addressing cleanup requirements for Area IV of the Santa Susana Field Laboratory (SSFL). The BOE is derived from the recommendations stated in the Area IV Santa Susana Field Laboratory Data Gap Analysis Report, provided to the public in June 2008 that identifies the need for collection of surface soil, subsurface soil, and bedrock samples for radionuclide characterization. The BOE provides the rationale for the field planning and implementation efforts necessary to collect and analyze soil and bedrock samples collected from the Chatsworth and Santa Susana geologic formations.

The determination of specific locations where the samples will be collected will be identified by the SSFL background study group comprised of USEPA, DTSC, and members of the local community.

The BOE was developed by CDM, and its major subcontractor SAIC, in support of a request for proposal issued by DOE. Therefore, this is not a final document and although initially reviewed by DOE has not been approved.

2.2.9 Radiological Characterization of Background Soils

The purpose of this subtask is to characterize the nature of radiological constituents of interest present in each of the two soil types present within the Santa Susana Field Laboratory. Locations where samples are to be collected are to be defined by the joint agency (USEPA, California DTSC, and community members) background work group. Analytical detection limits for the radionuclides of interest will also be identified by this work group. It assumed that the analytical detection limits will address to the extent possible, agricultural PRGs as defined by USEPA.

2.2.9.1 Field Sampling and Analysis Plan

A Field Sampling and Analysis Plan (FSAP) will be developed that will describe the objectives, approach, sampling methods, analytical protocols, and analytical detection limits for the sampling effort. It will also include a Health and Safety Plan (HSAP). The FSAP will be provided to DOE for review and comment. Upon revision and acceptance by DOE, the FSAP will be finalized.

2.2.9.2 Background Sampling

Conducting the background sampling will require procurement of a driller and analytical laboratory.

There are two distinct bedrock geologic formations at SSFL, the Chatsworth formation and Santa Susana formation. The field effort will consist of the collection of soil samples at 26 locations for each formation for a total of 52 locations. Sample locations will be determined by the agency background work group in coordination with stakeholders concurrent with development of FSAP. Samples for each location will include surface soils (i.e., the top 0.5 ft interval); two subsurface soil intervals (0.5 - 2 ft, and 5 - 6 ft) and one rock core per sample location for a maximum total of 208 samples being collected. Samples are to be obtained using auger drilling supplemented by a bedrock coring sampler. Sampling will be continuous and may need to be augmented by hand augering in areas that are inaccessible to a drill rig. Disposable sampling equipment will be used to the extent practicable with large equipment and reusable sampling equipment being subjected to decontamination between boring/sampling locations.

All soil and rock samples will be field screened as a best management practice to confirm that detectable radioactivity is below regulatory shipping limits, packaged and shipped to a contract laboratory.

Laboratory analysis will consist of gamma spectroscopy and alpha spectrometry with the target analyte list and detection limits being defined by the USEPA/DTSC background work group.

2.2.9.3 Background Sampling Report

Following completion of the sampling program, receipt of analytical results, data review and analysis, a report of the background study will be prepared. A draft of the report will be submitted to DOE for review and comment. The report will be revised to address DOE, USEPA, DTSC, and Stakeholder comments and finalized accordingly.

Deliverables:

- Soil Background FSAP with combined HASP
- Soil Background Study Report

Resources:

- A Geologist will oversee drilling activities
- Sample Team Leader will oversee sample collection, handling, and shipping
- Senior Radiological Control Technician (RCT) will provide radiological survey support and assist Sample Team Lead with sample collection activities.
- Senior Author to Field Sampling and Analysis Plan (FSAP) and Background Characterization Report (BCR)
- Site Safety and Health Officer to develop HASP
- Real Estate Specialist for acquisition of required access agreements
- Radiochemist and GIS support for development of FSAP and BCR
- Health Physics for QA/QC Review of FSAP and BCR

- Document Production for FSAP and BCR

ODCs

- Subcontract with driller
- Procure analytical laboratory services
- Field and sampling supplies
- Field equipment
- Field vehicles
- Transportation of samples to laboratory

Assumptions

- Access agreements to private or public property will be worked out by the agency work group.
- Sample locations to be identified by EPA and DTSC work group
- Assumes a production rate of 6 borings per day to drill, sample and backfill soil borings to approximately 15 ft, including accessing bedrock.
- Assumes a drilling cost for the 52 borings into bedrock of $82,000.
- Assumes approximately 9 days to complete the 52 borings
- Total project duration is 10 work days including establishing logistical support and decontamination area.
- Cost for full radioanalytical analysis are $1,310 per sample for soil samples and $1,320 for bedrock for total analytical cost of $273,000
- Laboratory quote based on lower detection limits than standard analyzes
- Samples will require 26 each 40 lb coolers for transportation from SSFL to Laboratory. ($67.96/cooler) $1766.96
- Field and sampling supplies and equipment including radiological instruments: $2713
- Copies of the quotes received are included in the supporting documentation attached to this proposal.

WBS No.: 2.2.9.1

Background Sampling and Analysis Plan		**Total Hours**
Resource		
Geologist Senior		10
Project Manger		8
Sampling Team Leader		10
Document Production 1		10
ES&H Manager		8
Geologist, Senior		8
GIS -		10
Radio Chemist		8
Radiological Control Manager		10
Real Estate Specialist (ROE)		8
Total Labor Cost	**$10,609**	

WBS No.: 2.2.9.2

Background Field Study	**Total Hours**
Resource	
Contract Administration	6
Geologist Staff	100
Procurement	24
Project Manger	8
Sampling Team Leader	100
Senior Radiation Control Technician	100
ES&H Manager	16
Geologist, Senior	8
GIS	10
Radio Chemist -	8
Real Estate Specialist (ROE)	24
Analytical Laboratory - Radionuclides	$273,000
Drilling Estimate	$82,000
Sample Containers	$1,767
Supplies	$2,713
Travel	$8,680
Total Cost with Labor	**$434,273**

*Field team rates are based on 10-hour days.

WBS No.: 2.2.9.3

Background Study Report	**Total Hours**
Resource	
Geologist Senior	24
Project Manger	8
Sampling Team Leader	16
Document Production 1	10
ES&H Manager	4
Geologist, Senior	100
GIS	24
Plan & Report Author	10
Radio Chemist	40
Senior Radiation Control Tech	10
Total Cost	**$29,382**

Resource	Rationale/Explanation of hours
Project Manager	♦ Provides management oversight and guidance ♦ Review plans and reports
Contract Administrator	♦ Provides financial management support ♦ Prepares invoices
Procurement	♦ Procures laboratory and driller
Geologist	♦ Prepares drilling procurement package ♦ Directs drill rig in collection of samples
Sample Team Leader	♦ Responsible for sample coordination and logistics
ES&H Manager	♦ Prepares HSAP
Geologist	♦ Develops plans and reports ♦ Review sampling progress and results
GIS	♦ Prepares figures and maps of sampling locations
Radiochemist	♦ Prepares radionuclide analytical specifications for laboratory bid ♦ Conducts data review, validation, and assessment ♦ Technical review of report
Real Estate Specialist	♦ Identifies access agreements with private and public land owners ♦ Acquisition of access agreements and/or permits
Lead Radiation Control Tech	♦ Onsite manager of radiological controls ♦ Ensure employees receive appropriate radiation training ♦ Ensure proper posting and controls at field locations ♦ Perform free-release surveys of equipment leaving site ♦ Perform monitoring for sample and waste shipments ♦ Support for sampling activities for background study
Senior Radiation Control Manager	♦ Technical review plan and report
Production Specialist	♦ Assist in development of plan and report ♦ Formats plans and reports ♦ Document production ♦ Edits technical plan and report
	♦
Driller – Procured	♦ Provide drill rigs as needed to support soil sampling
Laboratory – Procured	♦ Provide laboratory analysis for soil/rock samples
	♦

Revised Work Scope –Gamma Walkover Survey
Due Date: July 11, 2008
Pre-Decisional Draft for Discussion Purposes Only

The text and tables on the following pages provides the Basis of Estimate (BOE) for a gamma walkover/drive over survey for Area IV of the Santa Susana Field Laboratory (SSFL). The BOE is derived from the recommendations stated in the Area IV Santa Susana Field Laboratory Data Gap Analysis Report, provided to the public in June 2008, and the Draft Gamma Radiation Survey Plan for Santa Susana Field Laboratory Area, developed to administrative review stage during July 2008. The BOE provides the rationale for the field planning and implementation efforts necessary to conduct a drive over and/or walkover gamma survey of all of Area IV and drainages leaving area IV. Further detail regarding the proposed survey can be found in the Survey Plan, referenced above.

The BOE was developed by CDM, and its major subcontractor SAIC, in support of a request for proposal issued by DOE. Therefore, this is not a final document and although initially reviewed by DOE has not been approved.

2.2.8 Perform Gamma Walkover Surveys

2.2.8.1 Gamma Walkover Survey Work Plan

A gamma walkover survey approach document will be developed for discussion purposes between USEPA and DOE on the required scope of the effort. A work plan will developed based on the survey approach document that will present and describe all activities related to conducting the gamma drive over and walkover surveys. The plan will be developed in draft form for DOE and EPA review and will be finalized based on both agency comments. The Gamma Walkover Survey Plan will also include a Health and Safety Plan.

2.2.8.2 Gamma Walkover Survey

The purpose of this subtask is implement the drive over and walkover radiological surveys as outlined in the work plan. The surveys will be conducted to identify surface soils exhibiting gamma count rates that are elevated with respect to relative background. This will be accomplished by walking or driving over all accessible portions of the Santa Susana Field Laboratory Area IV (~ 290 acres) using 2-in x 2-in sodium iodide scintillation detectors tied to data loggers and global positioning sensors such that radiation count rate and location data are collected each second. Such data will be downloaded at the end of each day and will be subjected to evaluation to identify areas with elevated gamma readings. Upon confirmation of the presence of elevated gamma count rates, the area in question will be investigated using in-situ gamma spectroscopy to evaluate the nature of the constituents (radionuclides) contributing to the elevated count rates.

The basis of estimate does not include the costs for subsequent soil sampling.

This effort necessitates appropriate coordination with USEPA and California DTSC pursuant to establishment of statistically defensible background for use in in-situ gamma spectroscopy assessment as to whether elevated count rates in a given area are the result of naturally occurring radioactive materials.

The effort includes technical input to the project management team on survey issues, conduct of the Gamma Walkover survey addressing all of Area IV, drainages leaving Area IV, and groundwater seeps in the vicinity of Area IV, and all quality control checks as specified in the Work Plan. .

2.2.8.3 Gamma Walkover Survey Report

Upon completion of the gamma walkover survey, a report of the event will be prepared. The report will illustrate areas subject to drive over and walk over surveys, the location of the background reference area, survey area plots illustrating gamma walkover results relative to background readings, locations of anomalies, gamma spectroscopy results for the anomalies, and recommendations for soil sampling. A draft report will be provided to DOE and USEPA for review. The report will be revised based on DOE and USEPA comments.

Resources:

- Five Radiological Control Technicians (RCT) involving three Senior and one staff RCT to perform gamma walkover and driveover surveys and one lead RCT to provide overall management and investigate potential anomalies.
- One GIS/Health Physics Support Specialist to download walkover data and provide support in survey execution.
- Two radiochemists to perform in-situ gamma spectroscopy investigation of identified anomalies to ascertain whether elevated count rates are the result of naturally occurring or site-related radioactivity.
- A Radiological Control Manager will be on call to assess technical approaches/alternatives and provide miscellaneous related technical support, develop the gamma walkover survey plan including responses to comments, provide overall technical and project management of the survey effort (labor included in field effort), and author the report of survey activities.

- A Site Safety and Health Manager to develop the safety plan for the gamma walkover survey and provide health and safety support during implementation of the survey.
- A Health Physicist and Project Manager as Technical Reviewers of project plans and documents.
- Document Production for plan and report
- CAD/GIS for plan and report

WBS No.: 2.2.8.1	**FY 2008**
Plans (Gamma Walkover Survey)	**Total Hours**
Resource	
Contract Administration	3
Project Manger	6
ES&H Manager	12
GIS	12
Health Physicist	8
Lead Radiation Control Tech	6
Production Specialist	8
Radio Chemist	8
Radiological Control Manager	72
Total Labor Cost $18,879	

The table below presents the daily survey field requirements to conduct the driveover and walkover surveys. The hours in the table need to be multiplied by 50, the expected days of the survey, for total costs. Field periods are assumed to be 10 days of work followed by 4 days off. 40 hours per person have bee added to the total hours to account for travel. Due to expected travel on the first and last days of field work, 40 hours per individual and an additional field week have been added to the schedule to complete 50 full days of surveys. The driveover surveys are expected to occur first. Once completed, the majority of the walkover surveys will commence. The same crews conducting the driveover surveys will complete the walkover survey.

WBS No.: 2.2.8.2		
GW Survey		**Total Hours**
Resource		
Contract Administration		12
Procurement		24
Project Manger		48
Environmental Scientist I		540
Lead Radiation Control Tech		540
Radiation Control Tech		540
Radio Chemist		1080
Radiological Control Manager		200
Radiation Control Tech		1620
Travel Cost	$131,923	
Equipment Rental Cost	$108,927	
Total Cost with Labor	**$737,662**	

ODCs

- Rental of the field survey vehicles and radiological survey instrumentation for a two-month period as outlined in the following table. The costs in the table are for one month. The survey is anticipated to take two months.

2.2.8.2 Equipment Requirements				
Equipment	Quantity	Cost/Item/Month	Number of Months	Total Cost
2 each SUVs (or Gators) for four weeks at $798 per week including fuel	2	$3192	2	$12,768
Ludlum 2221 w/44-10 and RS 232 port (2X2)	12	$342	2.5	$10,260
GPS	10	$1596	2.5	$39,900
In-site Gamma Spectroscopy System	1	$11434	3	$34,302
Set of 3 radiation check sources	2	$188	3	$1,128
Ludlum 2360 w/43-89	4	$370.50	3	$4,446
Ludlum 2929 w/43-10-1	2	$313.50	3	$1,881
Ludlum 19	3	$114	3	$1,026
Personal Air Samplers	4	$154	3	$1,848
Mounting Assembly for Driveover SUVs	2	$342	2	$1,368
Total for Equipment				$108,927

Assumptions

- Assumes driveover survey of 25,000 to 30,000 square meters (6.2 to 7.4 acres) per day for both vehicles, mean of 7 acres per day used for estimate.
- Walkover surveys will address 3600 meters (0.9 acres) per day per team or approximately 1.8 acres for two teams. (Walkovers will utilize all project resources upon the conclusion of driveover surveys and will involve all areas inaccessible to wheeled vehicles.)
- Assumes that 200 acres of Area IV are amenable to the driveover survey.
- Assumes 100 acres will be addressed by the walkover survey
- Assumes that it will take 29 field days to accomplish the driveover surveys of 200 acres.
- Assumes one team can start walkover on day 1 concurrent with drive over covering 26 acres during the same 29 day period.
- Assumes that 4 teams will continue walkover for the remaining 74 acres.
- Assumes that the 4 teams will complete walkovers in an additional 21 days for 50 days of survey.
- Production rate assumes 1.5 hours setup and 1.5 hours download at the end of each day and 10 hour working days.
- In-situ gamma spectroscopy necessitates identification of acceptable background areas. The costs assume that the background location will be identified by USEPA Region 9.
- The field gamma walkover survey plan will require a total 40 days (8 weeks) of 10-hour survey days.
- Field Staffing assumptions:
    - Two each two-person teams performing driveover surveys such that one individual operates the vehicle while a second technician is monitors readouts of the gamma detectors to assure their proper function
    - One RCT performing walkover surveys of areas not accessible by vehicle with a support person in remote areas
    - One GIS/Health Physics Support Specialist to download walkover data, perform and provide survey execution support
    - One Lead RCT managing the field effort to include serving as SSHM for the field effort and confirming elevated areas
    - Two in-situ gamma spectroscopy radiochemists to evaluate the nature of elevated areas

- Radiological Control Manager (RCM) support to include 2 hours per day for QA/QC oversight and management and two each four-day trips to SSFL to support project meetings

2.2.8.2 Daily Production Rate Assumptions
Assume driveover use of two vehicles equipped with four each 2" x 2" NaI detectors and four each GPS will result in a driveover production rate of 7 acres per day. Assume 200 acres of Area IV are amenable to driveover for a total survey period of 29 days
Assume walkover rate of 0.9 acres per day per survey team. Assume one team for 29 days and four teams for 21 days
Assume 1.5 hours setup and 1.5 hours download at end of each day

WBS No.: 2.2.8.3

Reports (Gamma Walkover Survey)		**Total Hours**
Resource		
Contract Administration		5.00
Project Manger		10.00
Environmental Scientist I		18.00
ES&H Manager		8.00
GIS		16.00
Health Physicist		12.00
Lead Radiation Control Tech		10.00
Production Specialist		18.00
Radio Chemist		40.00
Radiological Control Manager		108.00
Total Labor Cost	**$33,050**	

DRAFT

GAMMA RADIATION SURVEY PLAN FOR SANTA SUSANA FIELD LABORATORY AREA IV

JULY 21, 2008

Science Applications International Corporation
8421 St. John Industrial Drive, Ste 200
St Louis, MO 63114

DRAFT

GAMMA RADIATION SURVEY PLAN FOR SANTA SUSANA FIELD LABORATORY AREA IV

JULY 21, 2008

prepared for

U.S. Department of Energy

prepared by

Science Applications International Corporation (SAIC) under contract to CDM

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ACRONYMS AND ABBREVIATIONS

AHA	activity hazard analyses
ALARA	as low as reasonably achievable
ANSI	American National Standards Institute
ATV	all-terrain vehicle
CAD	computer-aided design
CDM	Camp Dresser and McKee Inc.
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CHP	Certified Health Physicist
cm	centimeters
cpm	counts per minute
D&D	decontamination and decommissioning
DCGL	derived concentration guideline level
DOE	Department of Energy
DQO	data quality objective
EC&HS	Environmental Compliance and Health and Safety
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ETEC	Energy Technology Engineering Center
GIS	geographic information systems
GPS	global positioning system
HAZWOPER	Hazardous Waste Operations and Emergency Response
HPS	Health Physics Society
HSWP	health and safety work permit
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDC	minimum detectable concentration
NaI	sodium iodide
NIST	National Institute of Standards and Testing
NRC	Nuclear Regulatory Commission
OSHA	Occupational Safety and Health Administration
pCi/g	picocuries per gram
PPE	personal protective equipment
PRG	preliminary remediation goal
QA/QC	quality assurance/quality control
RPM	Radiation Protection Manager
SAIC	Science Applications International Corporation
SSFL	Santa Susana Field Laboratory
SSHO	Site Safety and Health Officer
µR/h	microroentgen per hour

1.0 INTRODUCTION

1.1 INTRODUCTION

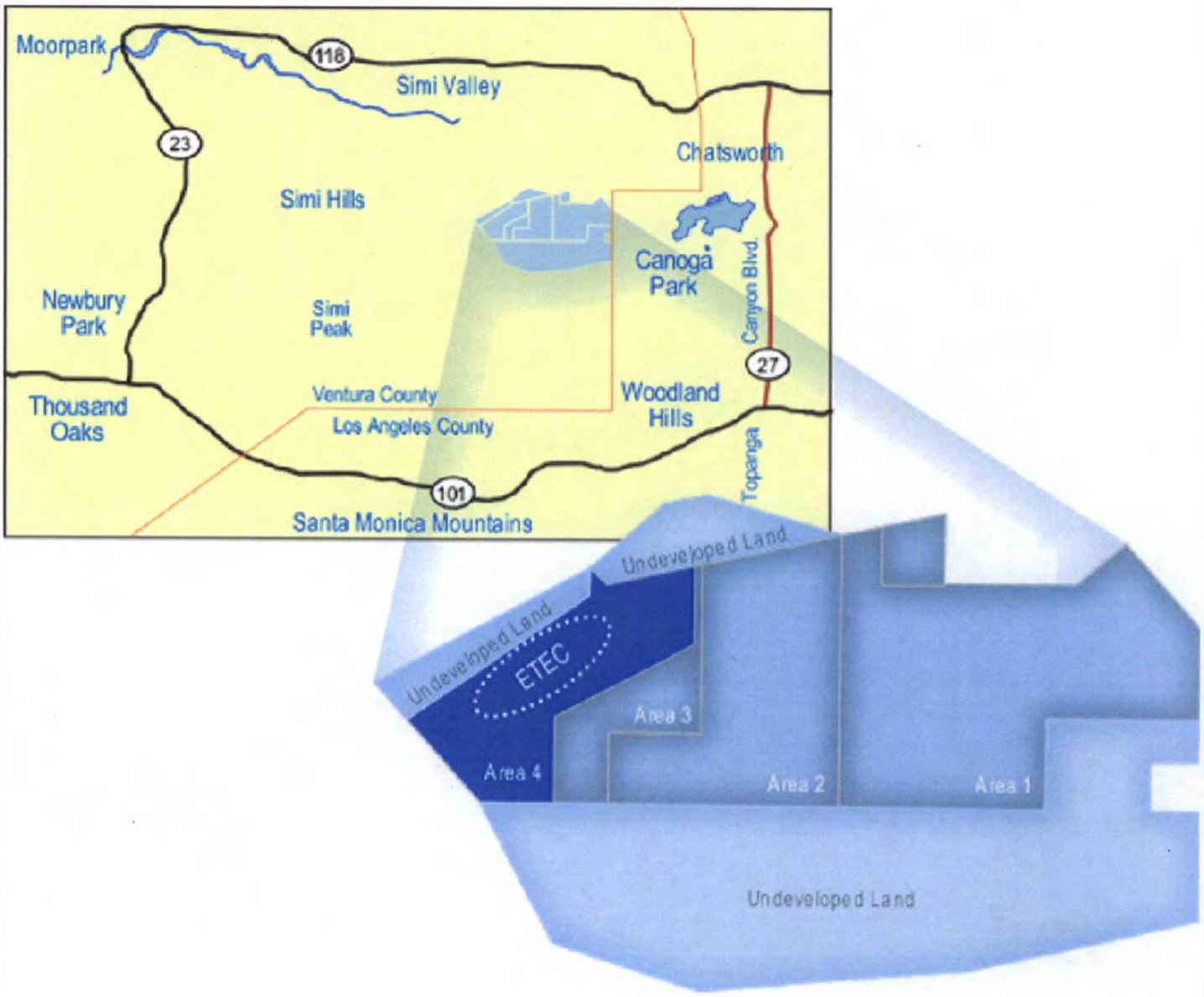
The Santa Susana Field Laboratory (SSFL) is located atop an east-west ridge of the Simi Hills, south of the community of Simi Valley, west of the San Fernando Valley, and approximately 40 miles north of downtown Los Angeles, California (Figure 1-1; Location of SSFL). Area IV is the western-most of four administrative areas within the SSFL site.

From the mid-1950s until the mid-1990s, the U.S. Department of Energy (DOE) and its predecessor agencies were engaged in and sponsored nuclear operations within Area IV of the SSFL. These operations resulted in the radiological contamination of soil and structures in portions of Area IV such that in 1988, DOE shifted its focus from research to decontamination and decommissioning (D&D) activities. D&D continued until 2007 when it was suspended following a decision from the U.S. District Court of Northern California which directed that an Environmental Impact Statement (EIS) be prepared to address the environmental effects. The DOE has subsequently pursued expeditious development of a comprehensive EIS for Area IV. As an integral part of the EIS development, existing site data was compared to that which is required to complete the EIS. This comparison identified the need for gamma radiation surveys to augment surveys previously performed. This plan addresses the performance of these gamma radiation surveys.

1.2 PURPOSE AND SCOPE

This document presents the plan for the gamma radiation surveys to be performed within SSFL Area IV. Given that relatively few radionuclides exist which do not emit gamma radiation concurrent with alpha and beta particle emissions, the use of gamma walkover surveys is an integral, state of the art, approach for locating areas of elevated radioactivity in surface soils. Consensus approaches for performing gamma walkover surveys areas are identified in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), a manual endorsed by the U.S. Environmental Protection Agency (EPA), U.S. Nuclear Regulatory Commission (NRC), Department of Energy (DOE), and Department of Defense (DOD) as well as in NRC NUREG-1507. Factors affecting the detectability of a given radionuclide include the energy and percent abundance of the gamma emissions of a given radionuclide, characteristics of the radiation detector (e.g., size and type of detector), and nature of site background. Radionuclides that emit relatively large number of gamma photons (e.g., Cs-137, Co-60, Ra-226 and Th-232 with daughters) are detectable at lower concentrations while those that emit few gammas (e.g., Th-230) must be present at much higher concentrations to be detected. In addition, a small number of radionuclides such as H-3 (tritium), Sr-90, Ni-63, C-14 and S-35 emit no gamma radiation and thus are not detectable by gamma walkover surveys. (Scan Minimum Detectable Concentrations are in Section 4.3.3.)

Gamma radiation surveys are primarily used to locate areas of surface soils that are elevated with respect to background to enable such areas to be more fully investigated by soil sampling and analysis. Using this approach, small areas of elevated activity are evaluated using biased sampling. The concentrations of radionuclides present within larger areas are, by contrast, determined by statistically based systematic sampling with the quantity and associated spacing of systematic samples being based in part on the ability of gamma scan surveys to detect radionuclides of interest. The gamma surveys required within Santa Susana Field Laboratory Area IV and adjacent areas are to identify localized areas exhibiting elevated



CDM

Santa Susana Field Laboratory Area IV
Ventura County, California

Figure 1-1
SSFL Location

radioactivity for subsequent sampling during field sampling efforts as required to evaluate risk-based alternatives in the EIS. Given that the surveys being performed are of the appropriate quality for use in final status survey evaluations, DOE will consult with stakeholders pursuant to the use of gamma survey results to support the final status survey process.

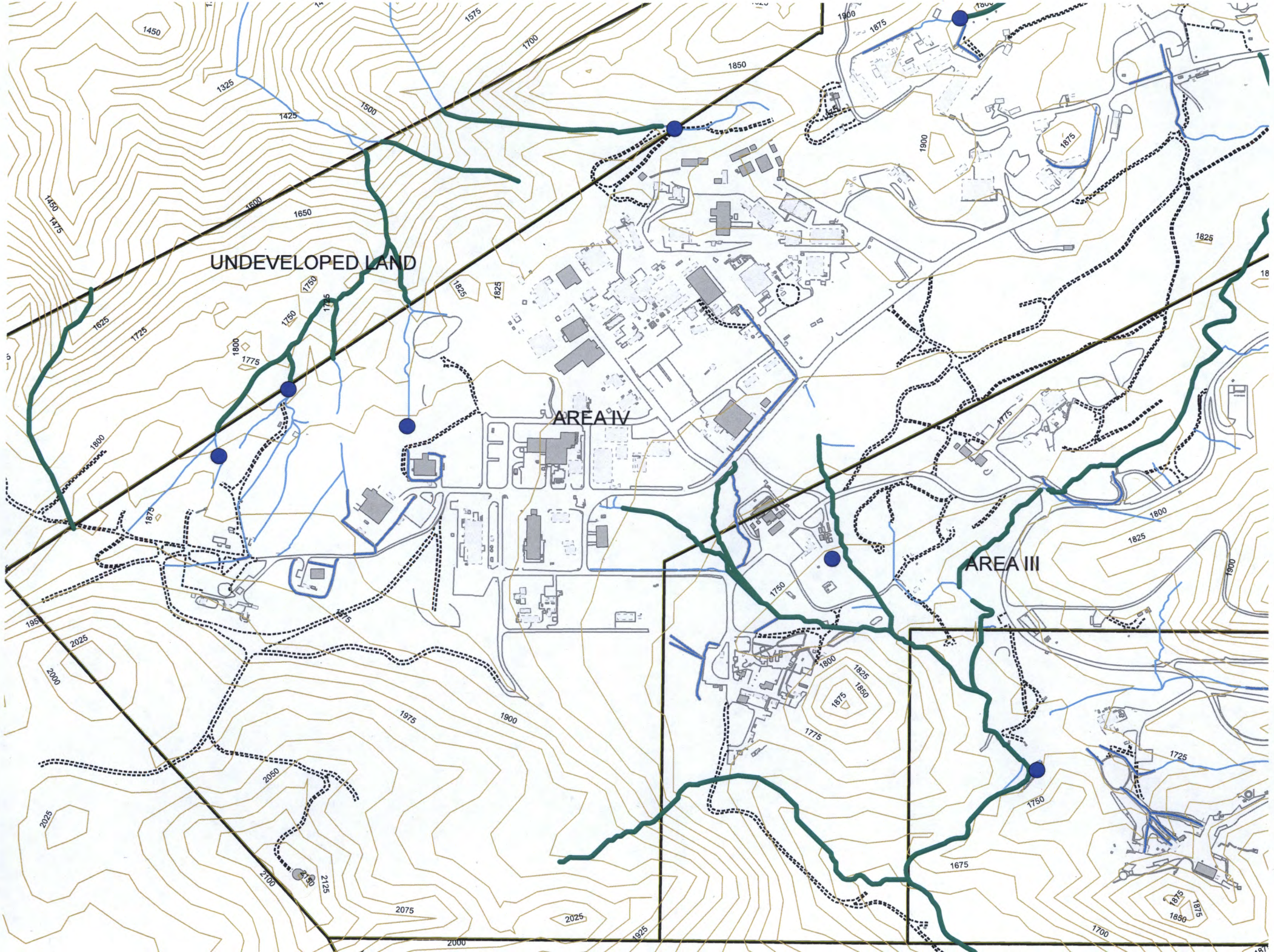
As used herein, the phrase "gamma radiation survey" is used to denote both gamma walkover and gamma driveover surveys. The gamma radiation surveys are primarily intended to locate soil areas that exhibit gamma emissions that are elevated with respect to background for subsequent soil sampling. Although soil sampling will be an integral part of the subsequent field sampling investigation providing data for the SSFL Area IV EIS, it is not addressed in this plan. The soil data are necessary to evaluate risk-based alternatives in the EIS. Although the survey described in this plan is being performed such that it complies with MARSSIM guidelines, the survey is not intended or designed to address final site closure status, which cannot be completed until necessary structures are removed and soil cleanup actions completed. To assure a thorough and seamless evaluation of the site, the gamma survey will include all portions of Area IV, adjacent areas beyond the Area IV boundary that surveys indicate may be impacted by radiological operations, groundwater seeps, and drainages to 400 meters (1300 feet) downstream from the Area IV boundary. Drainages to be surveyed are reflected on Figure 1-2, SSFL Area IV Drainages for Walkover Survey.

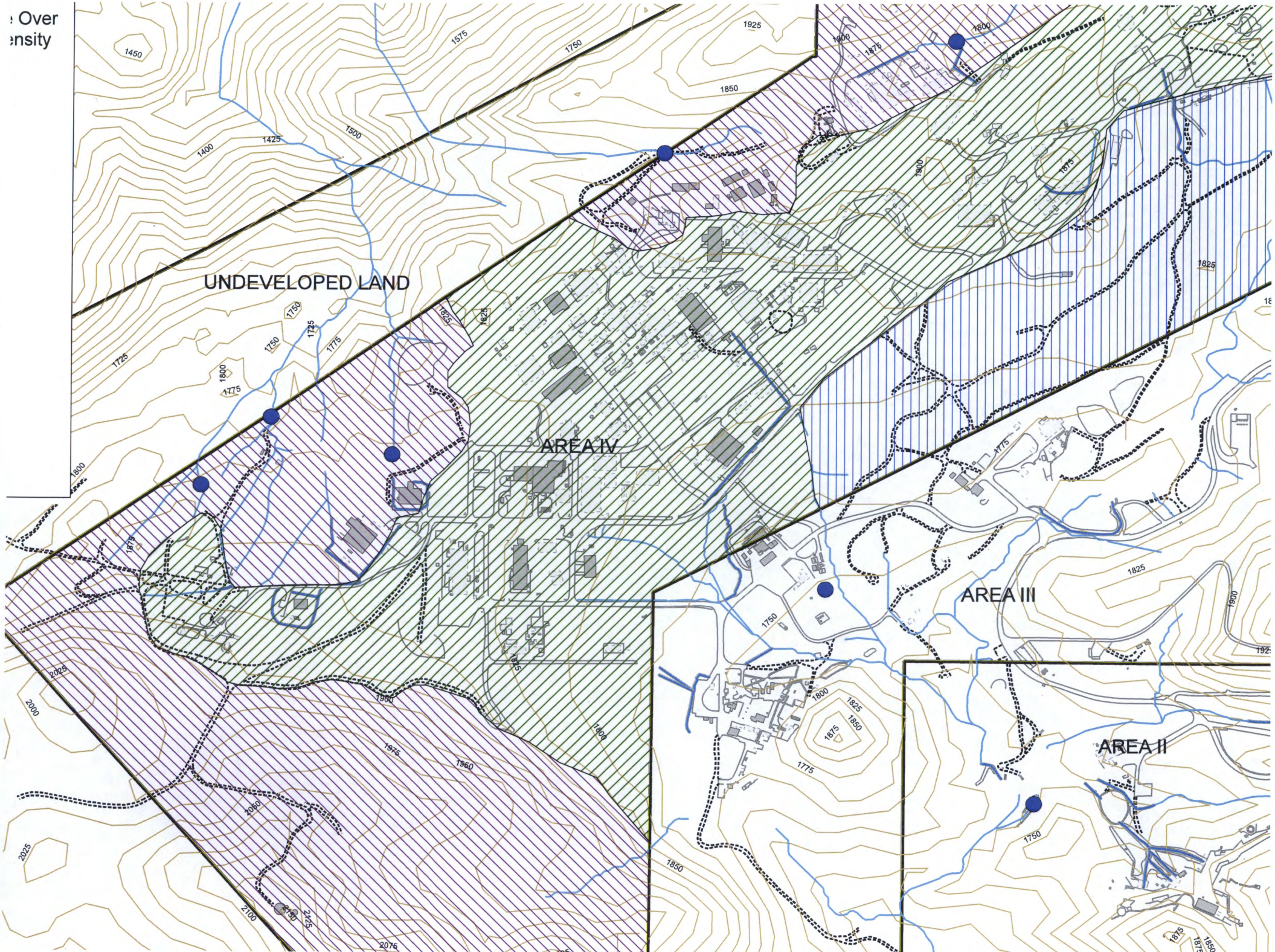
1.3 SURVEY CONSIDERATIONS

Gamma radiation surveys are accomplished by walking or driving over the designated areas using sensitive radiation detection equipment interconnected with data loggers and global positioning sensors. These surveys capture both radiation count rate and location data each second for subsequent download and evaluation.

Gamma radiation surveys previously performed within SSFL Area IV, to include the associated survey methodology and results, were also reviewed and compared to consensus technical approaches defined in MARSSIM. Some of these surveys were conducted prior to MARSSIM guidelines and used instrumentation or methods not meeting the needs for the EIS surveys. Those surveys provided information that was valuable but need to be repeated using protocols that meet current data quality objectives (DQOs). MARSSIM-compliant surveys are being performed to assure that the evaluation of potentially elevated areas is thorough and that the final product enables a seamless assessment of all portions of the site.

The Environmental Protection Agency (EPA) Region 9's draft "Scoping Document for Development of Workplan for a Soil Radiation Survey of Santa Susana Field Laboratory Area IV", dated September 5, 2001, was also reviewed pursuant to development of the approaches incorporated into this survey plan. In this Workplan, "EPA proposes a gamma scan survey that covers as much of the accessible and impacted site areas as possible using readily available equipment. The gamma scan will measure the gamma-ray activity in soils in Area IV using a calibrated, stable, mobile measuring system sufficiently sensitive to achieve state-of-the-art detection limits. The scanning system will be equipped with a Global Positioning System (GPS). According to the report on the 1993-94 survey (Rockwell International, 1996), approximately 80% of Area IV should be accessible to the mobile gamma scanning." EPA's estimate of the relative portion of the site accessible to mobile gamma evaluation was reevaluated. It is currently projected that about two-thirds of the site may reasonably be expected to be surveyed by mobile scanning vehicles and one-third by walking over the areas inaccessible to vehicles. (See Figure 1-3, SSFL Area IV Gamma Walkover Survey.)


UNDEVELOPED LAND
AREA IV
AREA III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2.0 SITE BACKGROUND

The DOE and its predecessor agencies were engaged in and sponsored nuclear operations within SSFL Area IV from the mid-1950s until the last of the research was terminated in 1988. During this time, the DOE has been responsible for the operation of the Energy Technology Engineering Center (ETEC), a facility that occupied about 90 of the 290 acres that comprise SSFL Area IV. ETEC did not have specific boundaries within Area IV but reflect a group of facilities owned by DOE which were utilized for nuclear research and other experimental activities. The gamma radiation survey will include all accessible portions of SSFL Area IV, as well as any adjacent areas that surveys indicate may have been impacted by radiological operations. Surveys will also include groundwater seeps and all drainages for a distance of at least 400 meters (1300 feet) downstream from the boundary to assist in evaluating the potential for off-site migration. Where nuclear operations were near the border of Area IV and if gamma radiation surveys in Area IV indicate elevated concentrations such that adjacent areas could have been impacted by nuclear operations, gamma radiation surveys will extend beyond the border to bound the elevated area.

3.0 ROLES AND RESPONSIBILITIES

On-site coordination and implementation of the survey described in this plan is the responsibility of the EPA Contractor's health physicist/survey supervisor. The radiological survey team will consist of, at a minimum, a Certified Health Physicist (CHP) who will function as Project Manager, a Project Health Physicist/Survey Supervisor, a computer-aided design (CAD)/geographic information systems (GIS) analyst, and health physics/radiation control technicians. The CHP will be responsible for coordinating any required field changes with Camp Dresser and McKee Inc. (CDM) and DOE prior to their approval. The roles and responsibilities of key personnel for this survey are listed in Table 3-1.

Table 3-1. Roles and Responsibilities

Role	Person	Phone	Responsibility
Project Certified Health Physicist/Radiation Control Manager	To Be Determined	To Be Determined	Assures overall project achieves project requirements
Project Health Physicist/ Survey Supervisor	To Be Determined	To Be Determined	Assures sample/survey activities are performed in accordance with this plan and that project quality, compliance, and health and safety requirements are followed.
Health Physics/ Radiation Control Technician	To Be Determined	To Be Determined	Ensure that all survey instrumentation is in proper working order and meets all QA/QC requirements prior to implementation of the survey. Confirm operational readiness of survey instruments as necessary to assure data quality. Conduct gamma radiation surveys as part of the survey team.
On-site Geographic Information System Analyst/Environmental Scientist	To Be Determined	To Be Determined	Ensure that data collected onsite is downloaded on a daily basis and that all GIS data is collected and analyzed in a defensible manner. Conduct gamma radiation surveys as part of the survey team.
Radiochemist	To Be Determined	To Be Determined	Perform in-situ gamma spectroscopy investigations of elevated areas.

QA/QC = quality assurance/quality control

4.0 SURVEY DESIGN

This document was prepared using guidance from MARSSIM (EPA, 2000a), Soil Screening Guidance for Radionuclides: Technical Background Document "Measuring Contaminant Concentrations in Soil" (EPA, 2000b), ANSI/HPS N13.12-1999. American National Standards Institute. *"Surface and Volumetric Radioactivity Standards for Clearance."* August 31, 1999 (ANSI, 1999), and NUREG 1507, "Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions", (NRC, 1998).

The gamma radiation surveys will be accomplished by driving and/or walking over the designated areas using all terrain vehicles (ATVs) to which four radiation detectors interconnected with global positioning sensors have been mounted. These detectors will collect gamma radiation count rates and location data each second and will store such information for subsequent evaluation. Upon completion of each day's survey efforts, radiological data collected that day will be graphically plotted on a map using the associated GPS data for the area surveyed. This map will then be evaluated to identify anomalies. Upon confirmation that an anomaly exists, the area in question will be investigated using in-situ gamma spectroscopy to identify the cause for the elevated count rates.

4.1 THE PROBLEM

Detailed information regarding contaminant concentration and distribution is required to support the EIS. As such, existing data has been subjected to comprehensive reviews and data gaps have been identified. These data gaps will be addressed through a field sampling effort that will include collection and analysis of samples of various environmental media including soils. Gamma radiation surveys are being performed to identify areas with gamma radioactivity that is elevated with respect to background for subsequent sampling as a part of the field sampling effort. The gamma radiation surveys may also be used to provide assurances to regulators and members of the public that site radiological contamination within Area IV is being fully and appropriately investigated.

4.2 THE DECISION

4.2.1 Gamma Count Rate Decision

The decision for all portions of the site is whether the gamma count rate is elevated with respect to background given the applicable scan minimum detectable concentration (MDC).

4.2.2 Background Reference Area

The background reference areas for the gamma walkover survey will be those identified by the stakeholders to include the community, public interest groups, California Department of Toxic Substances Control (DTSC) and other state agencies, and EPA. The background reference areas will need to include soil, asphalt, rock, etc.

4.3 INPUTS TO THE DECISION

4.3.1 Historical Information and Data Review

Available contamination information has been reviewed during the initial assessment of the area to provide insights into concentrations that may be expected and areas with greater potential for

elevated count rates. Although results for some surveys of some areas previously subjected to final status surveys achieve the quality objectives required for compatibility with MARSSIM, DOE has directed the performance of comprehensive surveys of all portions of the site to assure that the evaluation of potentially elevated areas is thorough and that the final product enables a seamless assessment of all portions of Area IV.

4.3.2 Gamma Radiation Surveys

Gamma walkover surveys will be performed to identify surface soils exhibiting gamma count rates that are elevated with respect to relative background. The gamma radiation survey will include all accessible portions of SSFL Area IV as well as any adjacent areas beyond the Area IV boundary that surveys indicate may be impacted by radiological operations. Surveys will also include groundwater seeps and all drainages to 400 meters (1300 feet) downstream from the Area IV boundary to assist in evaluating the potential for off-site migration.

Consistent with the EPA Region 9 Workplan proposal, the approach proposed for SSFL Area IV is to utilize gamma radiation surveys using ATVs equipped with Gamma detection and data logging instrumentation and global positioning systems (GPS). These gamma driveover surveys will be augmented by pedestrian radiation surveys in those areas that are not easily or safely accessible with ATVs. Additionally, there may be locations where safety considerations preclude normal scanning activities. When scans of areas such as the faces of cliffs are not possible, the depositional area immediately adjacent to and at the bottom of the obstacle will be subjected to a thorough survey to demonstrate that the rock face has not been impacted by radionuclide contamination. Buildings and their footprints are beyond the scope of the gamma survey effort but they will be addressed by separate building surveys.

Gamma radiation surveys will be performed using a bank of four each Ludlum Model 44-10, 2-in x 2-in sodium iodide (NaI) scintillation detectors interconnected to Ludlum Model 2221 Scaler/Ratemeters and a like number of Trimble Pro XRS GPS units (or equivalent models). These systems can be mounted on sport utility vehicles, all terrain vehicles, or similar means of transportation capable of achieving required speed and terrain limitations, using specially designed mounting assemblies. Each of these systems will independently operate to collect count rate and location data each second thus a total of four count rates and four corresponding locations are logged each second (i.e., systems do not respond as an array). Consistent with gamma radiation survey procedures, gamma radiation surveys proceed at a speed of about 0.5 meters per second (1.1 miles per hour) with detectors being about 10 cm (4 in) above the ground surface. Gamma radiation surveys will utilize two technicians, one to operate the ATV and a second to monitor each of the four detection systems to assure proper data collection. Manual walkover surveys will progress using the same general approach and the same equipment with the inclusion of monitoring of audible instrument responses.

Whether being used for driveover or walkover surveys, the detection systems collect and store gamma radiation count rate and location information in real time for subsequent downloading and evaluation, typically at the end of each day's survey efforts. After download, radiological data is merged, graphically plotted on a map of the area(s) surveyed and evaluated to identify potential anomalies. Potential anomalies are subsequently subjected to manual confirmatory walkover surveys using the same instruments (2-in x 2-in detectors and scaler/ratemeters) used for the initial surveys to replicate the original result and determine potential causes for elevated count rates encountered. Potential anomalies, as used herein, are areas in which the gamma count rate is 2000 counts per minute (cpm) or more above the background count rate of the surface material media present in a given area. Each such anomaly will be pin-flagged/marked.

(Irrespective of a given media (e.g., soil, asphalt, concrete, different types of rock) gamma background count rates vary both with respect to radioisotopic distribution as well as site topography. As such, determination of background count rates and associated variability is critical to successful identification of areas with elevated radioactivity.)

Each confirmed anomaly will be evaluated using in-situ gamma spectroscopy to determine whether elevated count rates are the result of naturally occurring radioactive material. This process involves use of a laboratory quality gamma spectroscopy detector system to collect and evaluate the gamma spectrum for each area of elevated radioactivity to identify the constituents contributing to elevated count rates. This is accomplished by comparing such spectra with those obtained in areas representative of background conditions.

Prior to the start of gamma radiation surveys, unimpacted areas that are geographically similar to the areas being surveyed will be identified by the EPA/DTSC Working Group based on technical evaluations performed in coordination with other stakeholders. These areas will provide information as to the range of variation commonly encountered in background count rates but will not be subtracted from either gamma survey results or in-situ gamma spectroscopy investigations. Rather, identification of areas with elevated count rates for gamma walkover surveys will be accomplished by comparison of survey results with the background count rates of the area immediately surrounding a given result. (Gamma count rates are used to identify areas that may not be fully evaluated by systematic soil analytical results.) In-situ gamma spectroscopy investigations will compare the results of a given elevated area with results obtained in background areas. Evaluations of elevated areas will consider both the variability of a given radionuclide in background and the nature of parent-daughter relationships.

Anomalies to be subjected to soil sampling will be reflected in the Field Sampling Plan based on a number of considerations including the magnitude of the count rates, intended use of the data (e.g., EIS risk assessment versus final status survey), variability of isotopic ratios in the area of interest and the availability of existing data with which to evaluate the anomaly.

4.3.3 Scan Minimum Detectable Concentrations

NUREG-1507 Section 6.8.2, Scan MDCs for Land Areas and Section 6.7.2 of MARSSIM entitled "Scanning Sensitivity" provide methodology for calculation of scan MDCs. The MDC is the minimum concentration of a given radionuclide that can be measured with certainty. The MDC of a scan survey "depends on the intrinsic characteristics of the detector (efficiency, physical probe area, etc.), the nature (type and energy of emissions) and relative distribution of the potential contamination (point versus distributed source and depth of contamination), scan rate, and other characteristics of the surveyor" (EPA, 2000a). NUREG-1507 calculates a scan MDC of about 6.4 pCi/g (900 cpm/μR/h) for cesium-137 for scan surveys using 2" x 2" NaI detectors. Scan MDCs for other radiological site constituents are generally inversely proportional to gamma energies of the respective radioisotopes. Other radionuclides of interest for which scan MDC values are listed in NUREG-1507, Table 6-4, *"NaI Scintillation Detector Scan MDCs for Common Radiological Contaminants* for 2" x 2" NaI detectors include Am-241 – 31.5 pCi/g; Co-60 – 3.4 pCi/g; Th-230 – 2120 pCi/g; Ra-226 with progeny – 2.8 pCi/g; Th-232 with progeny – 1.8 pCi/g; and natural uranium – 80 pCi/g total (U-234 and U-238 – about 39 pCi/g each with U-235 at about 1.7 pCi/g). Scan MDCs for other radionuclides of interest can be modeled and calculated as required.

4.4 STUDY BOUNDARIES

4.4.1 Geographic Boundaries

The geographical limits for the area to be surveyed will include all accessible portions of SSFL Area IV and any adjacent areas that surveys indicate may have been impacted by radiological operations. Surveys will also include groundwater seeps and all drainages for a distance of at least 400 meters (1300 feet) downstream of the boundary of SSFL Area IV to assist in evaluating the potential for off-site migration.

4.4.2 Radiological Constituents of Interest

Radiological constituents of interest are reflected in Table 4-1.

Table 4-1. Radiological Constituents of Interest*

Radionuclide	Source	Half Life (years)
^{241}Am	Neutron Capture in Fuel	458
^{133}Ba	Activation Product Detected Onsite	10.5
^{14}C	Neutron Capture in Graphite and Soil	5.73E+03
$^{243/244}$Cm	Neutron Capture in Fuel	29.1
^{60}Co	Activation Product in Reactors	5.3
^{134}Cs	Fission Product	2.1
^{137}Cs +D	Fission Product	30
^{152}Eu	Activation Product in Reactors	12.7
^{154}Eu	Activation Product in Reactors	16
^{155}Eu	Activation Product Detected Onsite	4.7
^{55}Fe	Activation Product in Reactors	2.6
^{3}H	Activation Product in Reactors	12.3
^{129}I	Fission Product	1.70E+07
^{40}K	Natural and Activation Product	1.30E+09
^{22}Na	Activation Product in Coolant	2.6
^{59}Ni	Activation Product in Reactors	8.00E+04
^{63}Ni	Activation Product in Reactors	92
^{237}Np +D	Neutron Capture in Fuel	2.14E+06
^{210}Pb +D	Natural Only	21
^{238}Pu	Neutron Capture in Fuel	86.4
^{239}Pu	Fuel material	2.40E+04
^{240}Pu	Neutron Capture in Fuel	6.60E+03
^{241}Pu	Neutron Capture in Fuel	13.2
^{242}Pu +D	Neutron Capture in Fuel	3.80E+05
^{226}Ra +D	Natural Only	1.60E+03
^{228}Ra +D	Natural Only	5.8
^{125}Sb +D	Fission Product Detected Onsite	2.758
^{90}Sr	Fission Product	27.7
^{99}Tc	Fission Product	2.13E+05
^{228}Th +D	Natural and Fuel Material	1.9
^{230}Th	Natural and Fuel Material	8.00E+04
^{232}Th	Natural and Fuel Material	1.40E+10
^{234}U	Natural and Fuel Material	2.30E+05
^{235}U +D	Natural and Fuel Material	7.10E+08
^{238}U +D	Natural and Fuel Material	4.50E+09

*Process history is still being evaluated. Additional radionuclides may be added to list.

4.5 DEVELOPMENT OF DECISION RULE

The purpose of this survey is to obtain data to identify areas that exhibit gamma radioactivity that is elevated with respect to relative background in each given area. Areas that are confirmed as exhibiting elevated gamma count rates will be pin flagged/marked until an all-inclusive review of gamma radiation data and development of a comprehensive sampling plan have been completed. Gamma radiation data will be compared to relative background. Relative background as used herein is defined as 2000 cpm above mean background in the survey area for the surface material being surveyed (e.g., soil, asphalt etc). EPA, DTSC, and stakeholders will be fully comprised of survey results and will be routinely consulted regarding identification and evaluation of areas with potentially elevated radioactivity.

4.6 SPECIFY TOLERABLE LIMITS ON DECISION ERRORS

Although the possibility of decision errors can never be totally eliminated, they can be minimized and controlled. The potential decision errors for this investigation are associated with obtaining, logging, and evaluating survey data. The following Instrument Quality Assurance protocols have been established to assure that survey data is of the requisite quality:

Instrument Quality Assurance

Action has been or will be taken prior to surveys to assure that survey instruments are:

- Selected based on the survey instrument's detection capability;
- Calibrated in accordance with manufacturers' recommendations and American National Standards Institute (ANSI) N323A, *Radiation Protection Instrumentation Test and Calibration – Portable Survey Instruments* (ANSI, 1997);
- Calibrated with a National Institute of Standards and Testing (NIST) source when appropriate to assure appropriate quality of radiological data; and
- Operated and maintained by qualified personnel, in accordance with Health Physics Program procedures (e.g., physical inspection, background checks, response/operational checks).

Radiological field instrumentation used for this survey will have been calibrated in accordance with ANSI N323A within the past 12 months (or more frequently if recommended by the manufacturer). Instrument quality control checks will be performed daily prior to their use, midway through the duty day and at the close of each duty day in accordance with Project Health Physics Procedures. Only data obtained using instruments that satisfy these performance requirements will be accepted for use during this survey. (i.e., Data obtained without the requisite quality will be recollected.) Instrument quality control checks consist of pre-operational checks, background checks and source checks as follows:

Pre-operational checks

Pre-operational checks will be performed prior to each use and whenever instrument response becomes questionable. Pre-operational steps include:

- Verifying instrument has current calibration.
- Visually inspecting instrument for physical damage that may affect operation.
- Performing satisfactory battery check. (Manufacturer's operating instructions will be used to define satisfactory battery check)

- Checking cable connection and cable integrity.

Background checks

- Background checks will be performed at the same location in a reproducible geometry three times daily as noted above as well as any time the instrument response appears questionable.
- Site-specific instrument background will be established upon arrival at the site by determining the mean value of 10 one-minute background counts.
- The acceptance criterion for background is a background count rate within two standards deviations of the mean background value. Background count rates more than two standard deviations from the mean will result in appropriate investigation to include recount of background.
- Multiple instruments of the same type to be used on the same GPS gamma radiation survey must have mean background values that agree within 10%.

Source checks

- Radiological field instruments used for gamma radiation surveys will be performance checked three times daily as noted above and any time the instrument response appears questionable. Source checks are essential to assure acceptance and usability of data collected. The established acceptance criteria will be instrument background within the range of background and source checks within ±10% of the known value. Source count rates more than 10% deviations from the mean will result in appropriate investigation to include recount of background.
- Source checks will be performed at the same location in a reproducible geometry.
- Ludlum Model 44-10; 2" x 2" NaI Gamma Scintillation Detector will be checked with a cesium-137 source.

4.7 ADDITIONAL SURVEY CONSIDERATIONS

The following actions, methods, and techniques will be utilized throughout the data collection process to minimize cost, field effort, and impacts to future associated work.

- Data will be collected and managed so that it will be usable in future area evaluations or investigations.
- Special emphasis will be placed on assuring that all areas within the geographic scope of the survey are appropriately surveyed.
- The Project Health Physicist or Radiation Protection Manager will routinely brief CDM and the EPA Contractor's Project Managers with regard to both areas exceeding the 2000 cpm action level and in-situ gamma spectroscopy results for elevated count rate investigations.

4.8 MEASUREMENT QUALITY OBJECTIVES

- All radiological survey instruments will be operated and maintained by qualified personnel, in accordance with the EPA Contractor's Health Physics Program procedures

- Gamma radiation data will be electronically recorded and visually displayed in color-coordinated maps.
- Gamma radiation data will be compared to the 2000 cpm standard such that areas in which the relative background is 2000 cpm (or more) above the mean background count rate of the surface material media present in a given area is flagged for manual verification of survey results.
- Manual verification that the count rate in a given area is 2000 cpm or more above the mean background will result in the area being pin flagged/marked pending decisions on sampling of such areas.
- Multiple instruments of the same type to be used on the same GPS gamma radiation survey must have mean background values that agree within 10%.
- Data not meeting quality objectives (e.g., source efficiency and background checks) will be recollected.

4.9 DATA ANALYSIS AND EVALUATION

Survey data consisting of the gamma count rate and location are collected and recorded each second as an integral part of gamma surveys. Such logged data is periodically downloaded and evaluated, typically at the end of each day, using Trimble Pathfinder Version 4.0 software to export data to a computer. Once transferred to the computer, data is incorporated into an MS Access Data Base where count rates are sorted by ascending order to assure that the highest count rates are preferentially displayed. Data is subsequently evaluated using ARC-GIS Version 9. This evaluation includes determination of the background count rates within each area of interest and for each type of media present. Count rates are color-coded beginning at the mid-point of the background count rate, most commonly based on 2000 count per minute intervals, and plotted on a base map of the survey area. Areas exceeding background by 2000 cpm or more will be subjected to confirmatory surveys and pin flagged to facilitate appropriate soil sampling at a later date. Decisions with regard to areas to be subjected to soil sampling will be coordinated with EPA, DTSC and DPH and incorporated into project sampling plans.

4.10 SITE SAFETY AND HEALTH – TO BE COMPLETED BY EPA CONTRACTOR

Site safety and health requirements for site tasks are based on potential physical, radiological, and chemical hazards. The survey team will follow the safety and health requirements documented in the Boeing "Service Provider Manual" (Boeing, 2005) or the general site safety and health requirements documented in the EPA Contractor's safety and health procedures, whichever is more restrictive.

The Project Health Physicist is the designated onsite Site Safety and Health Officer/Radiation Protection Manager (SSHO/RPM) for this radiological survey and maintains the responsibility for compliance with these requirements. Specific health and safety requirements will be documented on task-specific activity hazard analyses (AHAs) and health and safety work permits (HSWP) for survey and sampling activities detailed in this plan. The task-specific AHAs will be submitted to the EPA Contractor's Safety Manager for approval prior to the start of field activities. All AHAs will be regularly reviewed with project personnel with special emphasis on potentially critical hazards (e.g., snakebites).

The project-specific Site Safety and Health Plan (SSHP) that includes the task-specific AHA is included as Attachment A of this document.

4.11 SAFETY AND HEALTH TRAINING

All survey team personnel are required to meet the training requirements stated in the Site Safety and Health Plan (Appendix A) to include Hazardous Waste Operations Training (HAZWOPER) (40-hour and current 8-hour refresher), medical surveillance, health and safety orientation, and radiation awareness training. Prior to conducting work on site at SSFL, special consideration will be given to assuring that project personnel are aware of and fully implement all applicable requirements with special emphasis on those involving safety. Safety and health records will be kept and maintained according to the EPA Contractor's procedures.

4.12 TASK-SPECIFIC PERSONAL PROTECTIVE EQUIPMENT

The minimum level of protection that will be used for non-intrusive survey activities at this site is Level D Protective Equipment (safety boots and safety glasses). If intrusive activities such as soil sampling and activities that involve the handling of potentially contaminated objects or soils are required, the minimum level of protection will be Modified Level D Protective Equipment. Modified Level D Protective Equipment is defined as:

- safety boots (ANSI Z41)
- snake gaiters
- safety glasses with side shields (ANSI Z87.1)

Additional personal protective equipment (PPE) such as Tyvek® coveralls, boot covers, reflective safety vest, or cotton/leather gloves may be required based on conditions encountered during the survey or new information on site contaminants not currently known. The designated on-site SSHO/RPM has the responsibility for determining if an upgrade in PPE requirements is required once the survey team has mobilized to the site.

4.13 PERSONNEL MONITORING REQUIREMENTS

Periodic radiological monitoring will be conducted to determine the presence, if any, of radiological contamination on project equipment and personnel. Radiological monitoring of both gamma radiation equipment and personnel will be performed using portable radiological survey equipment prior to exiting the site to assure that any contamination encountered is not spread. All surveys and monitoring will be fully documented and records retained for inspection.

Relatively low concentrations of radiological constituents have been detected during previous soil investigations. Based on the minimal potential for levels of radiological constituents that could reasonably result in survey team members receiving external or internal radiation doses exceeding 10% of regulatory dose limits (i.e., 500 millirem/year), dosimetry and routine surveillance is not required. If it is determined that internal or external radiation monitoring is required, Boeing has committed to conducting the necessary monitoring. Irrespective of the potential for significant dose, survey team members will implement appropriate radiological controls to maintain all exposures "as low as reasonably achievable" (ALARA). ALARA actions will include as a minimum the monitoring of personnel and equipment prior to movement out of a contaminated area as well as prior to each departure from the field.

4.14 FIELD LOGBOOK ENTRIES

The survey supervisor (or designee) will maintain logbooks to document project information and a daily written record of survey and sampling activities. Logbooks will be maintained in accordance with SAIC *Field Technical Procedure-1215, Use of Field Logbooks* (SAIC, 1999). Logbook entries will include, but are not limited to:

- Project personnel;
- Personnel contacts;
- Training activities;
- Daily tailgate meetings;
- Instrument serial number and Surveyor performing radiological screen;
- Surveyor Signature;
- Weather conditions; and
- Non-conformances, issues and concerns.
- Calibration documentation
- Identification of instrument check sources
- Instrument background and source efficiency checks

5.0 WASTE DISPOSITION

Radioactive waste generated during the survey will be minimized. Anticipated wastes will be limited to non-hazardous waste such as face wipes and survey wipes. In the event radioactive or hazardous wastes are generated, they will be managed in accordance with the Boeing "Service Provider Manual" with both containers and disposal services being provided by Boeing. SAIC will not take ownership of hazardous wastes.

6.0 REFERENCES

American National Standards Institute (ANSI), 1997. *Radiation Protection Instrumentation Test And Calibration – Portable Survey Instruments*, N323A, New York.

ANSI, 1999 *Surface and Volume Radioactivity Standards for Clearance,* ANSI/HPS N13.12.

Boeing, 2005. Boeing "Service Provider Awareness Manual," January.

EPA, 2000a. EPA 402-R-97-016, *Multi-Agency Radiation Survey and Site Investigation Manual*, Revision 1, August .

EPA, 2000b. EPA/540 -R-00-006, *Soil Screening Guidance for Radionuclides: Technical Background Document*, August.

Nuclear Regulatory Commission (NRC), 1998. *Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions.* NUREG/CR-1507, Final, NRC, Washington, D.C.

ORNL, 1986. "Results of Radiological Measurements Taken in the Niagara Falls, New York Area", ORNL/TM-10076, dated November, 1986

EPA Contractor's *Field Technical Procedure, Use of Field Logbooks.*

EPA Contractor's *Health Physics Procedures.*

EPA Contractor's *Environmental Compliance and Health and Safety (EC&HS) Procedures Manual.*

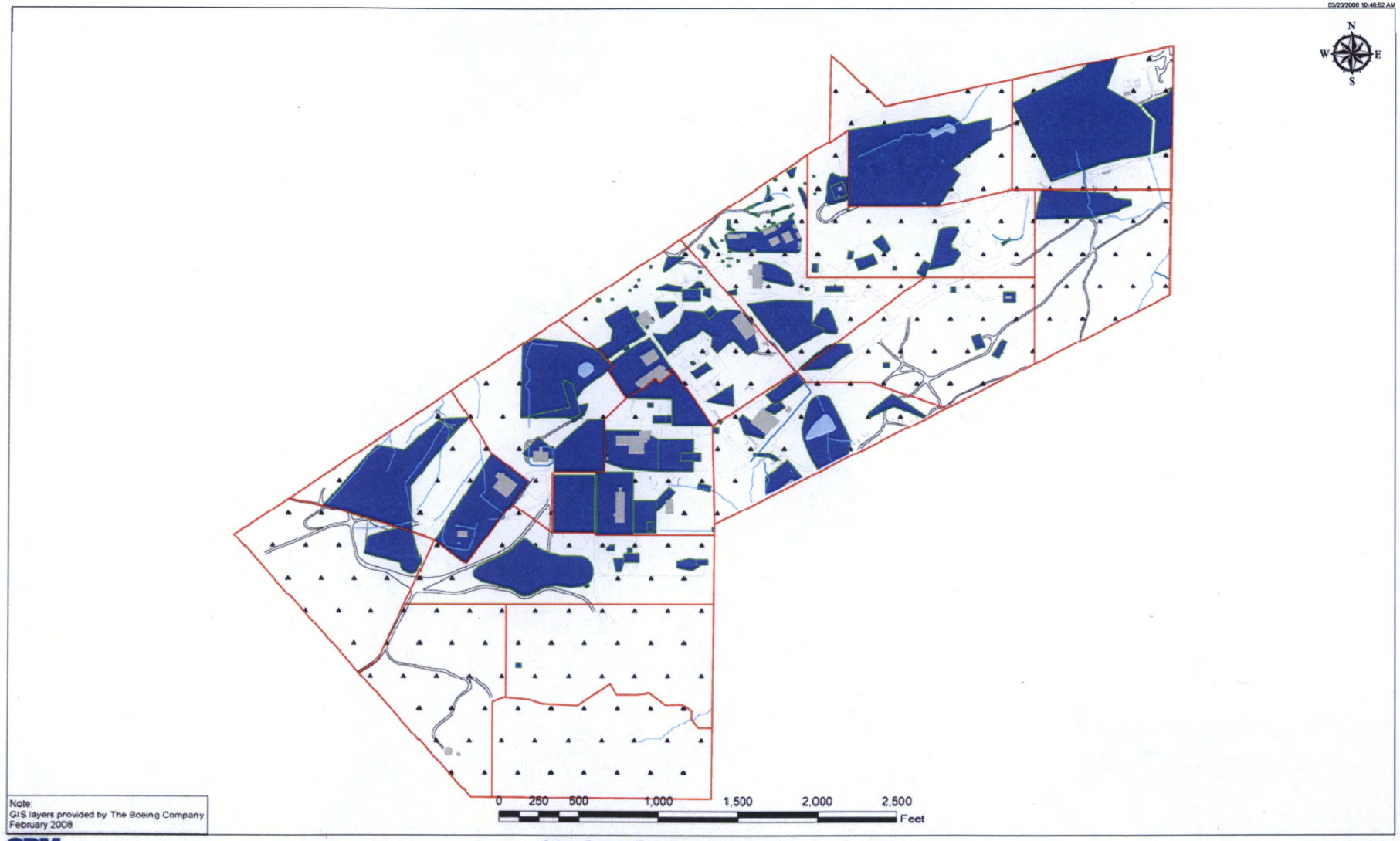
EPA Contractor's Plan for Performance of GPS Gamma Walkover Survey.

ATTACHMENT A

SITE SAFETY AND HEALTH PLAN

(EPA CONTRACTOR TO PROVIDE THEIR SSHP)

Pre-Decisional Draft For Discussion Purposes Only
Chemical Sampling Density Overview



CDM

Santa Susana Field Laboratory Area IV
Ventura County, California

Overview

Pre-Decisional-Draft For Discussion Purposes Only
Radiological Sampling Density Overview